457

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THE

HICKOK

ELECTRICAL
INSTRUMENT
COMPANY

OPERATING INSTRUCTIONS

MODEL 457

VOLT-OHM-MILLIAMMETER

CHOICE OF THE EXPERTS FOR SPEED, ACCURACY and DEPENDABILITY...

OPERATING INSTRUCTIONS

FOR

MODEL 457

VOLT-OHM-MILLIAMMETER

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THE HICKOK ELECTRICAL INSTRUMENT COMPANY
10514 Dupont Avenue - Cleveland 8, Ohio

E. I. A. GUARANTEE

The Hickok Electrical Instrument Company warrants instrument manufactured by it to be free from defective material or factory workmanship and agrees to repair such instruments which, under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any instrument or test equipment which proves to be defective, when returned to us transportation prepaid, within 90 days from the date of original purchase, and provided the serial number has been made known to us promptly for our records.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment, to injure their stability or reliability, or which have been subject to misuse, negligence, or accident, or which have had the serial number altered, effaced or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories, including all vacuum tubes not of our manufacture, used with this product are not covered by this warranty.

This warranty is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

Parts will be made available for a minimum period of five years after the manufacture of this equipment has been discontinued. Parts include all materials, charts, instructions, diagrams, accessories, etc., which have been furnished in the standard model.

RETURNING EQUIPMENT FOR REPAIR

Before returning any equipment for service, under warranty or otherwise, the factory must first be contacted giving the nature of the trouble. Instructions will then be given for either correcting the trouble or returning the equipment. Upon authorization, this equipment should be forwarded directly to the Hickok factory address, 10636 Leuer Avenue, Cleveland, Ohio, or to a designated service station in your locality. All correspondence pertaining to repairs should be directed to the Hickok office address, 10514 Dupont Avenue, Cleveland 8, Ohio, or to the authorized service station designated.

REGISTRATION CARD

The above guarantee is contingent upon the attached registration card being returned to the factory immediately upon receipt of the equipment.

TECHNICAL DATA SHEET

Equipment Supplied
(One Complete Unit)

Quan.	Name	Type	Stock No.	Dimensions Inches	Weight Lbs.
1	Volt-Ohm Milliammeter	457		6x8x3-1/4	3-3/4
1	Test Lead - Gnd (black)		12450-292	48	
1	Test Lead - (red)		12450-293	48	
1	Instruction Book		2490-340		

TECHNICAL CHARACTERISTICS

1. RANGES

   a. AC VOLTS: 0-3 - 15 - 60 - 150 - 600 - 1200
   b. DC VOLTS: 0-3 = 15 - 60 - 150 - 600 - 1200
   c. OHMS: 0-100 megohms (4 ranges)
   d. MICROAMPERES: 0 - 50
   e. MILLIAMPERES: 0-1 - 10 - 100 - 1000
   f. AMPERES: 0 - 10
   g. DB: -18 to + 57 in 5 ranges ("0" DB = 1 mw - 600 Ω)

2. SENSITIVITY

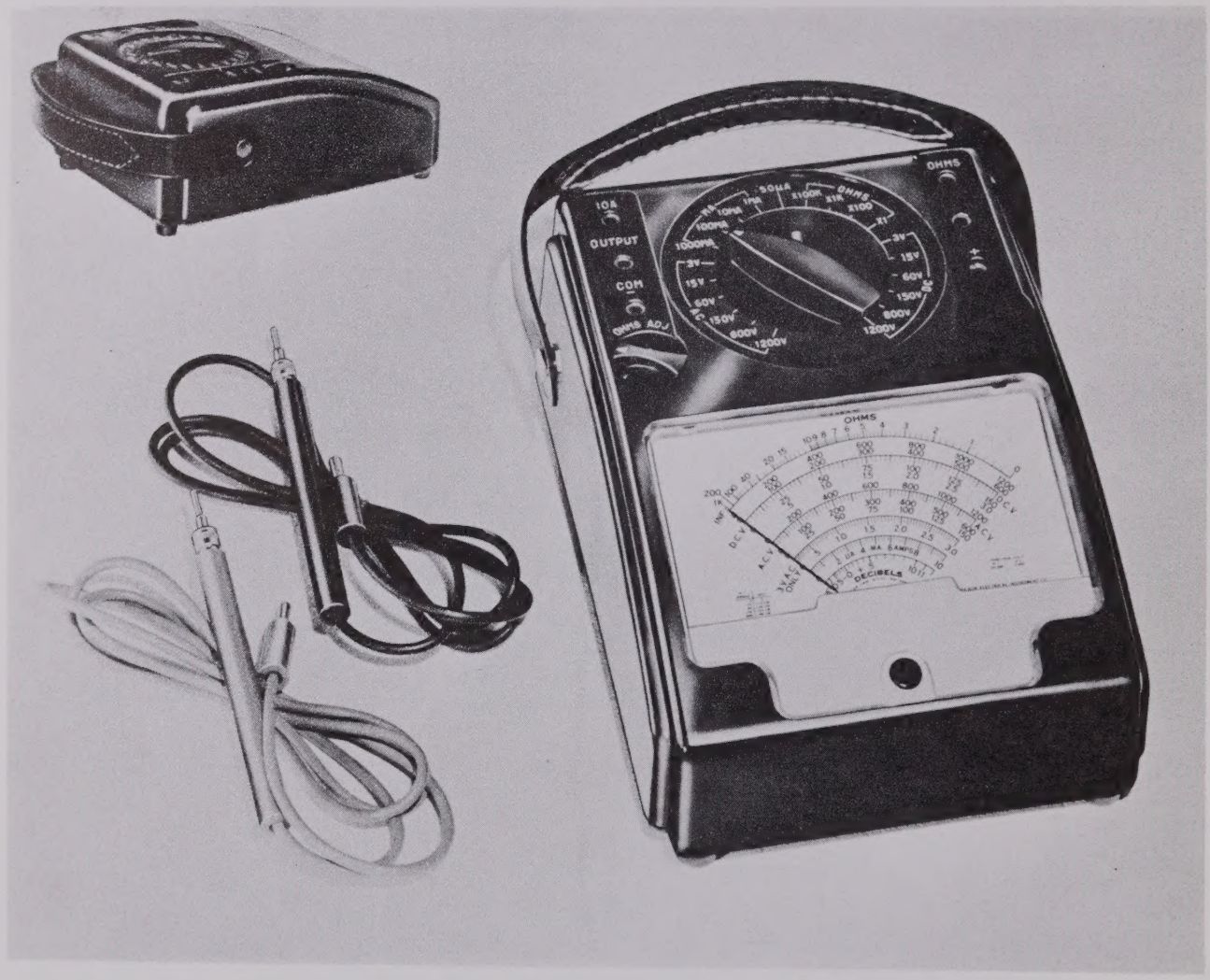
   a. AC VOLTS: 1,000 ohms per volt
   b. DC VOLTS: 20,000 ohms per volt
   c. METER: 38 microamperes

3. BATTERY COMPLEMENT

   1 - National Carbon #980, Size D, 1.5 volts (Hickok Code No. 2210-2)
   1 - Eveready #413 "Mini-Max", Size B, 30 volts (Hickok Code No. 2210-17)

4. METER

   a. Hickok Model 66W, Style No. 660-124
   b. Sensitivity: 38 microamperes DC
   c. Rectification: 1 copper oxide, full wave rectifier (external to meter).



MODEL 457
VOLT-OHM-MILLIAMMETER

DESCRIPTION

The Hickok Model 457 is a small, compact, stream-lined instrument, built under Hickok high standards of workmanship.

The functions and ranges of this instrument are specifically designed for the industrial and electronic technician.

The indicator is designed to give maximum readability and the slanted meter front allows this instrument to be read while in a flat position. Thus minimizing the danger of being knocked over or possibly falling from a workbench.

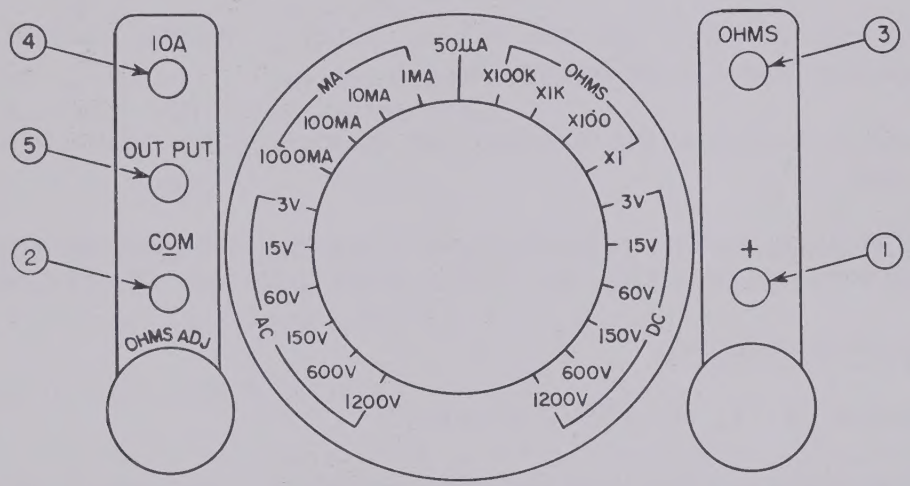


Figure 2 - Model 457

OPERATION

1. AC Voltage Measurements

   a. Ranges: 0 - 3, 15, 60, 150, 600, 1200 volts.

   b. Rotate selector switch to the AC function. For greatest accuracy, select a range where the reading will fall in the upper half of the scale.

   c. Plug red test lead into the #1 Jack ("+"), and the black test lead into Jack #2 ("Com"). (See Fig. No. 2).

   d. Read AC voltage on the appropriate scale and range.

2. DC Voltage Measurements

   a. Ranges: 0 - 3, 15, 60, 150, 600, 1200 volts

b. Rotate selector switch to the DC function. For greatest accuracy, select a range where the reading will fall in the upper half of the scale.

c. Plug red test lead into the #1 Jack ("+"), and the black test lead into Jack #2 ("Com"). (See Fig. 2).

d. Read DC voltage on the appropriate scale and range.

3. Ohms Measurements

a. Ranges: X1, X100, X1000, and X100K.

b. Rotate selector switch to the Ohms function.

c. Plug red test lead into the #2 Jack ("Com"), and the black test lead into Jack #3 ("Ohms"). (See Fig. No. 2).

d. Read resistance on the ohms arc and multiply by the setting of the selector switch.

e. To replace the dry cells, remove 4 screws securing nameplate to case and snap out defective dry cells. Note markings of dry cells polarity.

4. DC Mils Measurements

a. Ranges: 0 - 1, 10, 100, 1000 mils.

b. Rotate selector switch to DC mils position. For greatest accuracy, select a range where the reading will fall in the upper half of the scale.

c. Plug red test lead into the #1 Jack ("+") and the black test lead into Jack #2 ("Com"). (See Fig. No. 2).

d. Read DC mils on appropriate scale and range.

5. 50 Microamp Measurements

a. Rotate the selector switch to the 50 microamp function.

b. Plug red test lead into the #1 Jack ("+"), and the black test lead into Jack #2 ("Com"). (See Fig. No. 2).

c. Read on the 0-10 DC current range and multiply reading by 5.

6. DC Ampere Measurements

a. Range: 0 - 10 DC

b. Rotate selector switch to 1000 mils position.

c. Plug red test lead into the #4 Jack, and the black test lead into the #2 Jack (See Fig. No. 2).

d. Read on the DC current scale.

7. Decibel Measurements

a. Range: -18 to +57 db.

b. Rotate selector switch to AC VOLTS position. For greatest accuracy select range where reading will fall in the upper half of the scale.

c. Plug red test lead into the #1 Jack ("+"), and the black test lead into Jack #2 ("Com"). (See Figure No. 2).

d. Read on "DB" arc. Note AC range and add "DB" as indicated by the chart in the lower left corner of the scale.

8. Output Measurements

a. For measuring DB level or AC volts, when a DC voltage is present, plug red test lead into Jack #5. ("OUTPUT") and the black test lead into Jack #2 ("Com"). (See Figure No. 2).

b. Read on appropriate scale.

When making "OUTPUT" measurements, a 0.1 mf condenser is in series with the input. The reactance of this condenser will cause an error on low frequency measurements. However, under normal usage, the range and the frequency being measured is such that this error is negligible.

THEORY

DC Mils

Figure No. 3 is a simplified circuit of the DC mils function of this instrument.

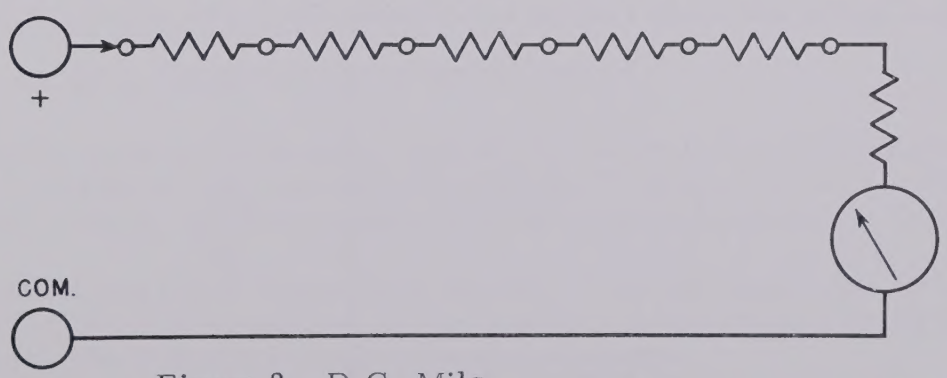


Figure 3. D.C. Mils

Basically, a milliammeter is a meter shunted by resistance. The value of the resistance is such that the total current for a given range is the sum of the current through the meter and the resistance.

To change the range, the value of the parallel resistor is changed by the selector switch.

Ohm Meter

Fundamentally, an ohm meter is a battery in series with a known resistance which is in a circuit with a meter. See Figure No. 4.

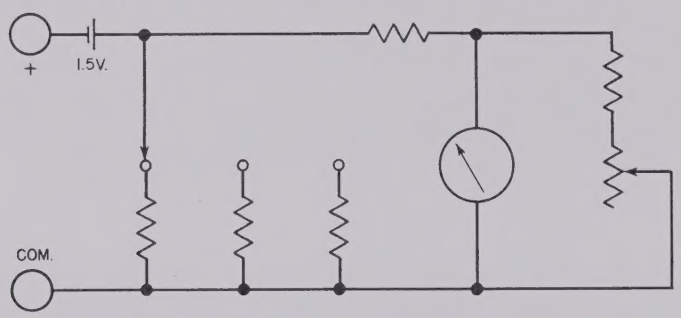


Figure 4. Ohms

When the input is shorted, the full voltage of the battery is developed across the known resistor and the meter is set to indicate zero ohms.

After setting the meter to zero, any unknown resistor placed across the input will divide the voltage across the known resistor in direct proportion to the value of the known and unknown resistors, the meter being calibrated in terms of the value of the unknown resistor.

DC Volts

A DC voltmeter is basically a series circuit of a meter and associated resistors (See Figure No. 5). The resistors are chosen so that the current in the series circuit is such that full scale deflection of the meter is obtained when the applied voltage is equal to the full scale reading of the meter.

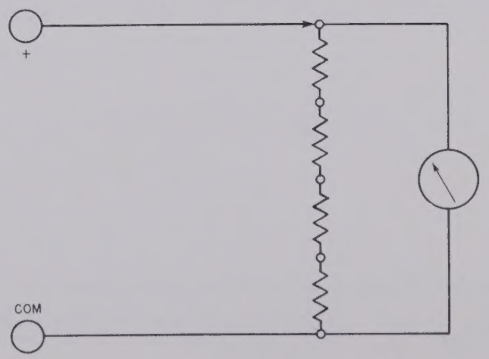


Figure 5. D. C. Volts

To change ranges, the series resistance is changed by the selector switch.

AC Volts

As indicated by Figure No. 6, the function of the AC measuring circuit is the same as the DC volts except for the rectification of the AC to provide DC current to operate the meter.

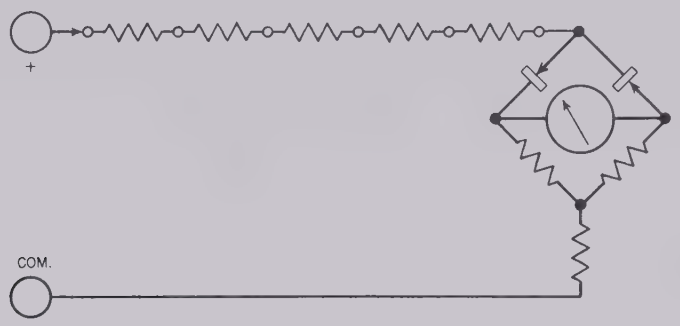


Figure 6. A.C. Volts

The indicator in the Model 457 is a DC movement and the calibration is based on average AC voltage. If AC voltage was impressed across the input without rectification, the average current would be zero and the meter would not respond. However, by rectifying the AC voltage, the current will always flow in one direction and the meter will indicate the average current flow. This deflection is then calibrated in terms of rms voltage.

Output

This function is for measuring AC voltages when a DC voltage is also present. The basic measuring circuit is identical to the AC volts circuit, Figure 6, except for a blocking condenser which is in series with the OUTPUT jack. This condenser blocks the DC voltage and permits the measurement of the AC voltage.

APPLICATIONS

Television, Radio, and Audio Service

The Model 457 is ideally suited for this service.

The versatility of this instrument allows for accurate testing of filament voltages across individual tubes, transformers, voltage testing of circuits suspected of being faulty, shorts, continuity tests, open or shorted condensers, fuses, etc.

The extreme range of the ohmmeter circuit - .1 to 100 megohms - is such that this instrument, in some instances, can be used to indicate shorted turns in low resistance coils and also check slightly leaky condensers.

Industrial and Field Use

The Model 457 is well adapted to use in the industrial field.

It can be used in numerous ways such as:

1. Testing of relays and control systems.
2. Testing for open or shorted circuits in conduit.
3. Maintenance of intercommunication systems.
4. Check fusing.
5. Voltage under load and no-load conditions.
6. Shorted and open armatures.

MAINTENANCE

As the Model 457 has been built under under the high standards of workmanship of a Hickok instrument, no maintenance other than routine replacement of dry cells should be necessary. Should other maintenance be required, however, it is suggested that the factory be contacted with regard to the nature of the trouble and, if necessary, the instrument be shipped to the factory or an authorized service station in accordance with "Returning Equipment for Repair". A schematic wiring diagram is given to aid in any maintenance work.

Two dry cells, one 1.5 volts and one 30 volts, are used in the source of DC in making ohmmeter measurements. If it is impossible to bring the meter to full scale deflection on the X1, X100, or X1000 ohmmeter ranges, it is probable that the 1.5 volt battery is weak. Likewise, if the meter cannot be brought to full scale on the X100K range, it is probable that the 30 volt battery is weak. To replace these batteries, remove name plate on base of case. The batteries can then be replaced without opening the case. Note the polarity marked near each battery and replace accordingly.

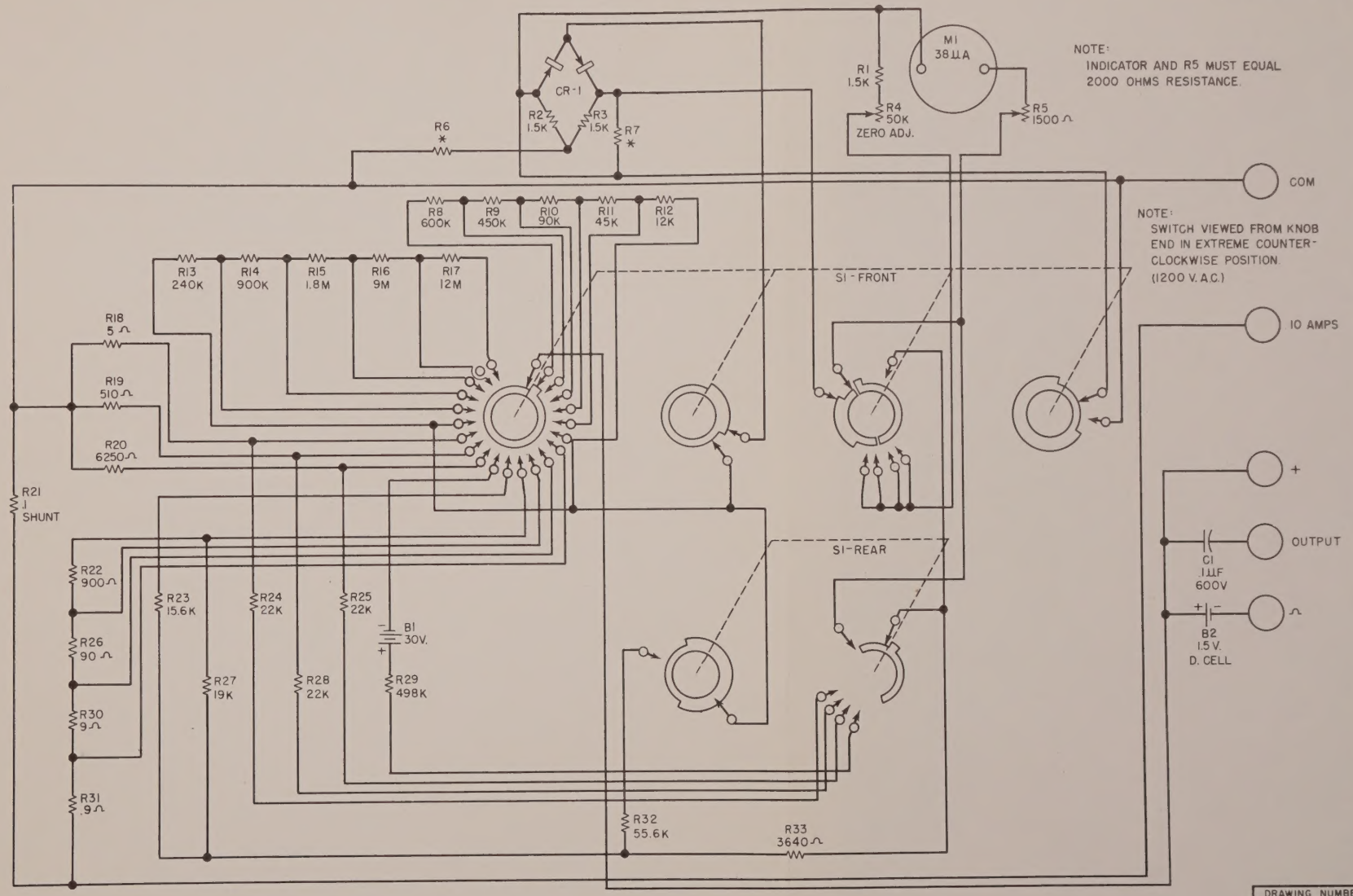
NOTE: There is a minimum billing charge of $1.50 for any one parts order. Prices will be furnished upon request.

Ref. Symbol	Hickok Code No.	Name and Description
	2490-340	BOOKLET: Instruction
C1	3105-207	CAPACITOR: .1 mfd, 600V, Astron Blue Point Type BP
M1	660-124	METER: 38μa
R4	16925-258	POTENTIOMETER: 50K Ω, Carbon
R5		POTENTIOMETER: 1.5K Ω, Wire wound
CR1	18150-47	RECTIFIER: Conant 121LF, double half-wave
R1, 2, 3	18412-151	RESISTOR, fixed: Composition, 1500 ohms, 5%, 1/2 watt.
R6	18411-911	RESISTOR, calibration: To be determined in production
R7	18412-181	RESISTOR, calibration: To be determined in production
R8	18545-7	RESISTOR, fixed: carbon film, 600K ohms, 1%, 1/2 watt, Continental Carbon type CP15
R9	18545-6	RESISTOR, fixed: carbon film, 450K ohms, 1%, 1/2 watt, Continental Carbon type CF15
R10	18545-5	RESISTOR, fixed: carbon film, 90K ohms, 1%, 1/2 watt, Continental Carbon type CF15
R11	18545-10	RESISTOR, fixed: carbon film, 45K ohms, 1%, 1/2 watt, Continental Carbon type CP15
R12	18545-9	RESISTOR, fixed: carbon film, 12K ohms, 1%, 1/2 watt, Continental Carbon type CP15.
R13	18545-11	RESISTOR, fixed: carbon film, 240K ohms, 1%, 1/2 watt, Continental Carbon type CP15
R14	18545-8	RESISTOR, fixed: carbon film, 900K ohms, 1%, 1/2 watt, Continental Carbon type CP15
R15	18545-4	RESISTOR, fixed: carbon film, 1.8 megohms, 1%, 1/2 watt, Continental Carbon type CF15
R16	18546-2	RESISTOR, fixed: carbon film, 9 megohms, 1%, 1 watt, Continental Carbon type CF25
R17	18546-1	RESISTOR, fixed: carbon film, 12 megohms, 1%, 1 watt, Continental Carbon type CF25
R18	18547-3	RESISTOR, fixed: metal film, 5 ohms, 1%, 1 watt, Continental Carbon type NA25
R19	18545-18	RESISTOR, fixed: carbon film, 510 ohms, 1%, 1/2 watt, Continental Carbon type CF15
R20	18545-13	RESISTOR, fixed: carbon film, 6350 ohms, 1%, 1/2 watt, Continental Carbon type CF15

NOTE: There is a minimum billing charge of $1.50 for any one parts order. Prices will be furnished upon request.

Ref. Symbol	Hickok Code No.	Name and Description
R22	18545-16	RESISTOR, fixed: carbon film, 900 ohms, 1%, 1/2 watt, Continental Carbon type CF15
R23	18545-14	RESISTOR, fixed: carbon film, 15.6K ohms, 1%, 1/2 watt, Continental Carbon type CF15
R24, 25, 28	18413-222	RESISTOR, fixed: composition, 22,000 ohms, 10%, 1/2 watt
R26	18545-3	RESISTOR, fixed: carbon film, 90 ohms, 1%, 1/2 watt, Continental Carbon type CF15
R27	18545-15	RESISTOR, fixed: carbon film, 19,000 ohms, 1%, 1/2 watt, Continental Carbon type CF15
R29	18545-17	RESISTOR, fixed: carbon film, 498K ohms, 1%, 1/2 watt, Continental Carbon type CF15
R30	18547-1	RESISTOR, fixed: metal film, 9 ohms, 1%, 1Watt Continental Carbon type NA25
R31	18670-101	RESISTOR, spool, .9 ohms, made from 19430-1
R32	18545-1	RESISTOR, fixed: carbon film, 55.6K ohms, 1%, 1/2 watt, Continental Carbon type CF15
R33	18545-2	RESISTOR, fixed: carbon film, 3640 ohms, 1%, 1/2 watt, Continental Carbon type CF15
R21	19210-82	SHUNT: .1 ohm, 10 amp. made from 23930-21
S1	19912-377	SWITCH: rotary, 4 section, 21 positions
	12450-292	LEAD ASSEMBLY: Black
	12450-293	LEAD ASSEMBLY: Red
B1		BATTERY: 30V, National Carbon #413 or equal
B2		BATTERY: 1.5V, National Carbon #950 or equal

ALT	DRAWING NUMBER
	924 W



NOTES:
1. RESISTANCES ARE IN OHMS. K = 1000 OHMS, M = 1,000,000 OHMS.
2. ✦ = CONNECTION POINT, + = NO CONNECTION.
3. ✶ = CALIBRATION RESISTOR.

NO.	ALTERATION	BY	APP'D	DATE

DRAWING NUMBER
924 W

VOLT OHM MILLIAMMETER

SCHEMATIC WIRING DIAGRAM MODEL 457

DRAWN & TRACED	CHECKED	APP'D	DATE
LDD			7-21-58

THE HICKOK ELECTRICAL INSTRUMENT CO.
CLEVELAND, OHIO

HICKOK
H
ELECTRICAL
INSTRUMENT
COMPANY
10514 DUPONT AVE., CLEVELAND 8, OHIO